

## Description

Method for monitoring an application in a packet-switching network

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The invention relates to a method as claimed in the precharacterizing clause of patent claim 1.

10 Networks in which the network elements communicate with one another by means of packet switching are used for transmission of data and for communication purposes. Networks such as these may either be locally bounded, in which case they are referred to as LANs (LAN = Local Area Network), or else they may be distributed  
15 worldwide (WAN = Wide Area Network), for example the Internet. In addition to the connecting paths (data line), networks such as these comprise a large number of different network elements, such as switches, routers and computers (servers, workstations), the  
20 latter with applications installed in them.

For communication between the network elements, it is generally irrelevant where these network elements are physically and geographically arranged.

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The data is in each case combined to form data packets for transport, and is addressed using a unique network address for the receiving network elements. Since the onward transport of the data in the network is carried  
30 out in an automated manner, the actual location of the addressed network component, for example a server with an application, is irrelevant to the user. However, this situation is different when network elements have to be accessed for the purpose of monitoring or for  
35 maintenance purposes. Control procedures are often required for this purpose, and these have to be carried out directly at the relevant network element.

In packet-switching networks, it is important to

identify in good time whether an application or a network element is operating correctly, is faulty or has even stopped prematurely ("been terminated"). It should be also possible to monitor this from a central, remote location (workstation). In order to make it possible to monitor and control the network elements of widely distributed networks from a central location, these network elements frequently have interfaces for remote access. These interfaces generally operate using a standardized protocol in order that various network elements and applications can be administered from a central point owing to a single application program, which is also referred to as an administration tool. One such standardized protocol is, for example, the SNMP (Simple Network Management Protocol), which allows simultaneous monitoring and control of widely differing network elements and applications within one administration tool. The administration tool is, for example, a Presence Application, which is installed on a PC and is also referred to as an NMS (Network Management Station).

The individual applications (processes) and network elements are monitored and controlled for remote access by local monitoring instants, so-called management clients. Each management client for a network element or for an application is connected to an instant which combines the state messages from the management client and converts them to a message in accordance with the protocol. This instant is also often referred to as an SNMP agent, and the messages are frequently referred to in the literature as "SNMP traps", or "traps", for short. The SNMP agent sends the traps to one or more network management stations, where the monitored network elements and applications and their current states (for example online, offline, or the instantaneous load level) are displayed (indicated), and from where control commands can be transmitted back

to the network elements and applications.

The control commands and the state information, that is to say the traps, are in this case transmitted as UDP  
5 messages (UDP = User Datagram Protocol).

In modern data networks, in particular in relatively large company networks and in the Internet, communication methods are frequently used and are known  
10 as presence/instant messaging methods. The examples of this are the applications "Windows Messenger", "AOL Messenger" or "ICQ". In this case, specific applications are installed on the workstation computers of the users, which are frequently also referred to as  
15 messaging applications and in which a list with preferred communication partners in the network is maintained. Lists such as these are also referred to as "buddy lists", because this communication method is preferably used simply for interchanging text messages  
20 with friends and acquaintances (so-called "chatting"). In the buddy list, symbols, for example in the form of a red or a green dot, mark the current status of the possible communication partner, that is to say for example whether the relevant user is currently  
25 accessible (Online), is busy, or is not registered with the network (Offline).

With regard to presence/instant messaging applications, a distinction is drawn between those with a central  
30 server, and those without a central server. While, in the case of the arrangements without a central server, the messages relating to the current state of the individual users and the messages relating to the state changes, for example offline to online, must be  
35 interchanged directly between all the relevant workstation computers, in the case of those arrangements with central servers a list of all the communication partners which can be accessed in the

communication network is maintained in these servers. The state information on the individual users and the messages relating to the state changes are just transmitted from the individual workstations to these  
5 central servers, and are then noted in its list. For each communication partner in this list, note is made relating to the workstation computers on the network at which this communication partner is located in the buddy list. State messages and messages relating to  
10 state changes are then sent from this server only to those workstation computers whose user relates to this communication partner. As soon as one of the communication partners is identified in the buddy list as being online, it is possible, for example, to simply  
15 interchange text messages with that communication partner. This procedure is commonly referred to as "chatting".

Presence/instant messaging applications are known in  
20 various networks with different protocols. The Session Initiating Protocol (SIP) is predominantly used for setting up multimedia sessions in data networks, for example for speech transmission ("Voice-over-IP" = speech transmission with the aid of the Internet  
25 Protocol); in this context, the SIMPLE extension (SIMPLE = SIP for Instant Messaging and Presence Leveraging Extensions) defines a protocol extension which can be used for the purpose of presence/instant messaging.

30  
One known method for monitoring and, in particular also for controlling computer-supported applications from a remote location is the use of so-called PC remote control programs. One example of a program such as this  
35 is the PC-Anywhere software manufactured by Symantec. In this case, special software is installed both on the PC to be monitored and to be controlled and on the PC which is used for maintenance purposes, allowing the

remotely located PC to be controlled by mouse/keyboard inputs, and its screen content to be displayed on the PC's own screen. However, this is dependent on a compatible operating system being installed on both PCs  
5 and on a data channel with sufficient bandwidth being connected between the two components.

One disadvantage that has been found with the known methods for monitoring applications is that the  
10 applications and processes to be monitored must be configured in a predetermined manner. In addition, special, proprietary software (for example "HP OpenView") must often be installed in the PC hardware that is used for monitoring.

15 Proprietary supplements are additionally required for remotely controlled administration using the SNMP method, for example the use of programs for remote control PCs, for example "PC-Anywhere". Applications  
20 are monitored by means of the SNMP protocol in conjunction with the connection less UDP protocol, so that the loss of an event message ("Trap") is not always recorded.

25 The invention is thus based on the object of monitoring and controlling applications and network elements in a network, in a simple manner.

This object is achieved by the features specified in  
30 claim 1.

The solution provides that the application is registered by means of the monitoring instant as a first communication partner in a list of communication  
35 partners which can be accessed in the network, and that the Presence Application is registered in the list as a second communication partner which monitors the first communication partner. The state and/or state changes

of the application is or are transmitted to the Presence Application as a characteristic which is associated with the first communication partner, or as a message which is transmitted from the first communication partner, with the monitoring being carried out on the basis of the characteristic or of the message. This allows the instant messaging method, which frequently exists in the networks in any case, to be used for monitoring applications and network elements. There is no need to install new network protocols and specific application programs for monitoring the applications and network elements. This allows the method also to be used in widely distributed networks, for example in the Internet.

The method is refined further in an advantageous manner by means of the characterizing features in the dependent claims.

When control instructions are transmitted from the Presence Application to the monitoring instants in order to control the application, the Presence Application can also carry out the administration, that is to say the control, of the application.

The installation of new network protocols and the use of a dedicated central network instant is avoided if a presence/instant messaging system is used for registration and for finding monitoring instants.

State messages and messages relating to state changes are transmitted reliably if the transmission of the state is ensured by means of a handshake process.

A protocol which already exists and has been prudent in many networks is used if the registration of the application and the transmission of the state are carried out using an SIP infrastructure and the SIMPLE

extension to the SIP protocol.

If an application can be monitored by means of any desired number of Presence Applications, and Presence  
5 Applications can monitor any desired number of applications, even complex networks with many applications, network elements and Presence Applications can be monitored and administered.

10 There is no need for manual administration procedures when restarting applications and network elements, since the monitoring instant which is associated with an application to be monitored is automatically registered in the list, or is found and registered on  
15 the basis of the request by the Presence Application.

One exemplary embodiment of the method according to the invention will be explained in the following text with reference to the drawing.

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The single figure shows a network NW in which a Presence Application PA, a central server PS (Presence Server) with a configuration databank DCS (Dynamic Configuration Settings) connected to it, a monitoring  
25 instant MC (Management Client) and applications AP1 (Application 1), AP2, AP3 to be monitored are provided.

Messenger software is installed as a Presence Application PA on a workstation computer PC and is used  
30 for administration, display and use of a list of subscribers in a network NW. A user can enter other users in the network NW in this list (Buddy-List), with these other users being its potential communication partners, whose respective status in the network NW  
35 should be displayed permanently. This status draws a distinction between "Online", "Offline" and "Busy", whilst providing the user with a quick overview of the potential communication partners with which he can set

up a communication link at the present time.

In addition to the states that have been mentioned, any other desired states, either predefined or  
5 self-defined, can also be displayed.

(Text) messages can be produced with the aid of a (text) editor, for sending to the communication partners. The text messages which have been sent from  
10 the communication partners to the workstation computer PC of this user are displayed in a display window (which is not illustrated).

The Presence Application PA has access to a Presence  
15 Server PS via the network NW. The Presence Server PS is a central instant in the network NW where the state information for the communication partners is recorded and is passed on to all of those Presence Applications PA where the corresponding communication partner is  
20 included in the buddy list. A databank DCS which is associated with the Presence Server PS is used to store which Presence Application PA must be supplied with the state information for which communication partners. The Presence Server PS is also used for passing on the  
25 (text) messages. Two or more Presence Servers PS may, of course, also be arranged in a network NW, in addition to any desired number of users (Communication Partners, Presence Applications, Applications).

30 The Presence Server PS communicates with one or more management clients MC. In this case, each management client MC may be installed on the same hardware (Host) as the Presence Server, and may also be integrated in the Presence Server PS. The management client MC is  
35 used for monitoring the applications AP1, AP2, AP3. Each application AP1, AP2, AP3 is installed on the same server S as the Presence Server PS and the management client MC; however, it may also be installed on a



different network element in the network NW, or else may be a "standalone" appliance which, for example, is arranged as a router in the network NW.

5 The network NW is a local area data network (LAN) which interchanges data by means of packet switching in accordance with the Internet Protocol (IP protocol). The network NW is also used for speech data communication (Voice-Over-IP) which is handled on the  
10 basis of the SIP protocol (Session Initiation Protocol). The SIP protocol is operated in the network NW by means of the SIMPLE extension, which provides protocol elements for simple, secure communication in instant messaging environments.

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The monitoring of the application program Winword.Exe as the application AP1 will be described in the following text as one example of a monitoring process. The status of this application AP1 should be displayed  
20 continuously on the workstation computer PC within the Presence Application PA. In order to monitor the application AP1 "Winword.Exe", the user of the workstation computer PC starts the Presence Application PA and enters the application "Winword.Exe" there as  
25 the communication partner to be searched for. In this case, he enters as a supplementary address element the Internet address (IP address) of the server S on which the application "Winword.Exe" is installed. This procedure reflects the addressing in an SIP  
30 environment. Users are in this case identified on the basis of the pattern Name@Host (for example winword.exe@129.103.148.155). The host name may, of course, also be used instead of the IP address and is then resolved by a name server (DNS Server) that is  
35 arranged in the network NW. The Presence Application PA is now registered via the network NW as the user of the Presence Server PS. For this purpose, in addition to the name and the network address of the application

"Winword.Exe" to be monitored, monitoring data is also  
interchanged between the Presence Application PA and  
the Presence Server PS and is used for the  
authentication that is required for the registration  
5 process. The Presence Server PS now enters in its  
configuration databank DCS the name and the network  
address of the Presence Application PA as well as the  
information relating to the fact that the Presence  
Application PA should be supplied with the state  
10 messages and the messages relating to state changes of  
the application "Winword.Exe".

The Presence Server PS then starts a checking process,  
which is repeated at regular time intervals, with the  
15 management client MC that is associated with it to  
determine whether any state information can be recorded  
by an application AP1 "Winword.Exe" which is associated  
with that management client MC and, if necessary,  
stores in the management client MC the instruction to  
20 signal the information relating to the current state  
and future state changes of the application AP1  
"Winword.Exe" to the Presence Server PS. The management  
client MC is in this case used as a "process monitor",  
by means of which it is also possible to monitor and  
25 control those processes (applications) which have no  
specific monitoring interface (for example SNMP  
interface).

Each state information item which arrives at the  
30 Presence Server PS is transmitted via the application  
AP1 and in accordance with the information that is  
stored in the configuration databank DCS via the  
network NW to the Presence Application PA, where it is  
visualized.

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The user list (Buddy List) which is maintained in the  
Presence Application PA represents a process list for  
the applications AP1, AP2, AP3, in which the

"Online-Status" (Online, Offline, busy) corresponds to the process status (active, closed, busy) for the application AP1, AP2, AP3. The instant messaging function (chat function) for the "natural" users of the Presence Application PA is related to the applications AP1, AP2, AP3 to form a trace function. Text-based information which is sent from the management client MC to the Presence Application PA, where it is visualized, is used for detailed description of the status of the respective applications AP1, AP2, AP3, and may also be stored for further processing, or passed on to other instants.

Text-based information which is sent in the opposite direction is evaluated by the management client MC, and is converted to control commands for the respective application AP1, AP2, AP3.

The Presence Application PA need not - as described here - be an application that is created for communication between "natural" users. Alternatively, the Presence Application PA may also be specific software for monitoring and controlling applications AP1, AP2, AP3, which controls the protocol elements that can be used in the network NW, that is to say in this case the SIP protocol with the SIMPLE extension, in order to access the management client or management clients MC associated with the applications AP1, AP2, AP3.